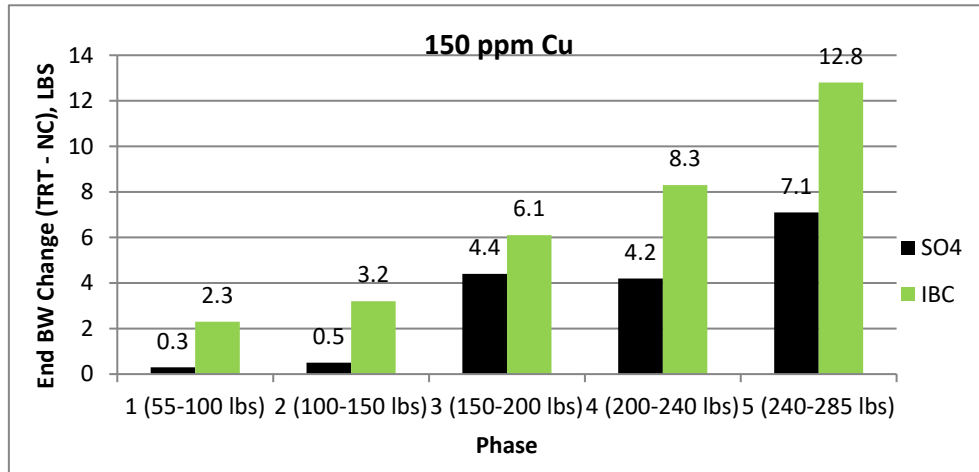


While the goal of a nutrition program is to provide the proper level of nutrients to meet the pig's needs for growth and performance, there are times when additional nutrients can be beneficial. The number of feed additives and their intended purposes are many and far ranging. The information below will focus on the general use and potential benefits of the most commonly used feed additives.

- **Copper Sulfate and Copper Chloride:**

Copper has been shown to have a growth-promoting quality in nursery and growing pigs. Generally levels between 125-250 ppm of copper are most effective with the higher levels of copper showing an improvement in both ADG and feed efficiency in growing pigs. Copper chloride (IBC) has the same or even better results than copper sulfate (SO4) with the advantages of a lower feeding level. The use of copper at high levels, above 250 ppm, can produce negative effects on pig performance along with toxicity risks at greater levels.



Source: Kansas State University, 2013

- **Zinc Oxide**

Research has shown improvements in nursery pig growth rate and a reduction in diarrhea when pigs are fed therapeutic levels of zinc oxide between 3000-4000 ppm.

- **Magnesium Oxide**

Most cereal grains and plant protein products contain fairly high levels of magnesium, so with proper care and a carefully formulated diet, a deficiency of magnesium would not be a concern. However, some studies have shown that supplementary levels of magnesium can reduce stress and aggressive behavior in pigs. Magnesium oxide can be added to swine diets at the rate of 5-10 lbs per ton to reduce stress and cannibalism.

- **Potassium Chloride**

Potassium chloride can be added to late finishing diets to help reduce shrink during marketing. The typical inclusion rate is 1-2 lbs per complete ton of feed.

- **Chromium**

Chromium can be added to the diets in the form of chromium picolinate, nicotinate, yeast or propionate. Chromium improves glucose utilization by enhancing the effects of insulin binding to cell receptors. Research has shown that chromium supplementation (200 ppb) can enhance leanness in grow-finish pigs by reducing backfat and increasing loin eye area.

- **Carnitine**

Carnitine is a lysine metabolite that functions within the cell to transport lipids into the mitochondria for use as energy. It has also shown promise in reducing backfat in finishing pigs. Carnitine may also increase birth and weaning weights of young pigs when fed to sows and influence muscle fiber development of the fetuses in gestating sows.

- **Essential Oils**

Essential oils are the aromatic oily liquids derived from materials such as flowers, leaves, fruits, and roots. Essential oils can act as antimicrobials and antioxidants enhancing the immune response and reducing diarrhea in pigs. Interest in essential oils continues to grow in popularity, especially with the use of antibiotic-free nutrition programs. Individual essential oils have different specificities, which has led to inconsistent results. The value of a multiple oil product is a more consistent response given the diversity of gut bacterial populations at different farm locations and at different times.



**Encapsulated Essential Oils – this process protects the essential oils, improves palatability and makes them heat stable.**

- **Mannan-oligosaccharides (MOS)**

Derived from the yeast cell wall of *Saccaromyces cerevisia*, MOS functions in the gastrointestinal tract in two ways. First, MOS adsorbs and excretes pathogenic bacteria that would otherwise attach to the intestinal epithelium. Secondly, MOS enhances the response of the immune system. Research has shown a positive effect on ADG, FC and ADFI for pigs fed MOS.

- **Probiotics and Yeast:**

Probiotics or direct-fed microbials (DFM) are used to enhance gut intestinal health. Direct fed microbial's are defined by the FDA as a source of live "viable" naturally occurring microorganisms. In general these microorganisms fall into one of three categories: 1) lactic acid producing bacteria 2) bacteria belonging to the Bacillus genus and 3) Saccharomyces yeasts. There is concern in regards to the viability of these organisms post feed processing, especially following pelleting due to prolonged exposure to high temperatures. Research has shown that the use of DFM's improves ADG and also reduces the incidence of diarrhea.

- **Prebiotics**

Prebiotics are non-digestible food ingredients that stimulate the growth of beneficial bacteria that will improve the health of the host. Prebiotics include non-digestible carbohydrates and resistant starches (i.e cellulose, xylans). Examples of prebiotics include inulin, MOS and yeast culture products. Prebiotics have an advantage over DFM's in that prebiotics are not affected by heat processing.

## Feed Additives FAQ

- How do I know when a feed additive should be used?
  - In most cases, pigs receive their daily nutrient requirements through the diets fed to them. However, when health challenges occur or when there are specific performance expectations, the use of a feed additive may be beneficial.
- Does Hubbard Feeds routinely recommend certain feed additives?
  - Hubbard Feeds has a number of products that we recommend when additional nutrition support is needed. These products are known as our OptiCare line of feeds. A few of the more common ones are highlighted below:
    - GutCIE – an all natural fermentation based feed additive that contains *Lactobacillus acidophilus*, GutCIE promotes the growth of beneficial bacteria in the gastrointestinal tract. This translates into improved feed intake and average daily gain
    - Assist is a combination of copper chloride and a yeast culture product designed to be used in grow-finish pigs. Copper chloride has been shown to improve average daily gain. The yeast culture product helps pigs manage stress caused by specific disease challenges and is a tool to reduce mortality associated with Hemorrhagic Bowel Syndrome (HBS).
    - Opti-Remedy is a blend of essential oils that reduces the harmful bacteria in the gut. The combination of essential oils from oregano, thyme, cinnamon, capsicum and citrus fruit extract also promote the growth of beneficial bacteria in the gastrointestinal tract. Opti-Remedy can be used in all stages of pig production.
    - Opti-Pak Efficiency – a nutrition fortification pack formulated for the last 40-80 lbs of gain in finishing pigs. Opti-Pak Efficiency improves average daily gain and feed conversion by increasing the digestibility of the diet.
- Tailbiting is a problem in my herd. Which feed additives should I consider?
  - Tailbiting can be caused by a number of factors and nutrition is often viewed as the culprit. Before considering a feed additive, a thorough review of the ventilation system should be done to make sure there is enough air movement and the temperatures are correct for the season and size of pig. Stocking density should also be analyzed since pigs that are crowded will have tendency to exhibit undesirable behaviors. Magnesium oxide is often added to the diet because of the calming effect it can have on pigs, which may then reduce cannibalism.